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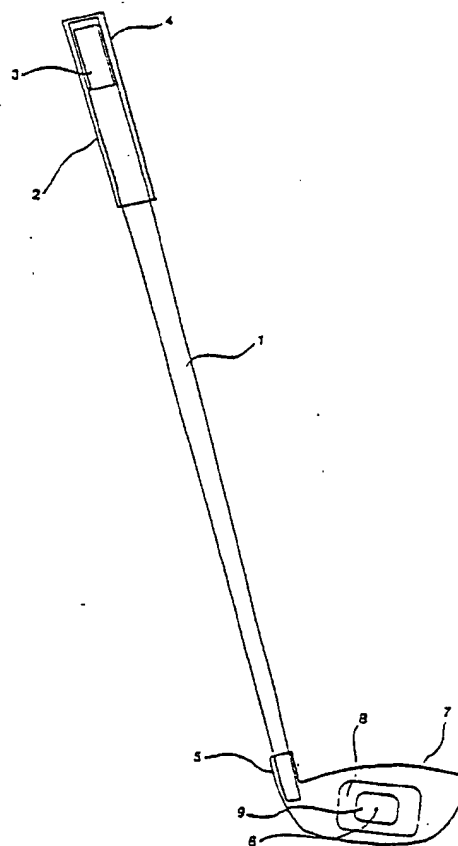
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(54) Title: GOLF CLUB AND OTHER HAND-SWUNG ARTICLES

(57) Abstract

The invention relates to articles that are swung when in use, such as sporting articles or tools. As exemplified with a golf club the centre of gravity of the club is moved along the shaft (1) away from the head (7) by increasing the weight at the end (4) of the shaft (1). This can be done by a heavy insert (3).



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"GOLF CLUB AND OTHER HAND-SWUNG ARTICLES"

The human body is a mechanical structure that is capable of motion, powered by muscular contraction and controlled by an incredibly complex form of computer, the brain. Because of the manner of its construction it operates through a system of levers and the only force that it can generate must originate from the principles of leverage. Whatever other force forms are considered it must always be remembered that they are reactive or secondary to the primary force that created the original energy, that of leverage.

BACKGROUND ART

In the golf swing the clubhead is accelerated to peak velocity by the actions of muscles and levers, it is therefore quite reasonable to assume that the principles of leverage are applicable to it.

For all force there must be equal and opposite resistance.

In the golf swing the resistance is found in the left side from the foot right through to the hand. The left hand which is above the right on the final lever, the shaft, applies resistance to the driving force of the right shoulder, arm and hand as the club enters the final zone of acceleration to impact.

The acceleration of the head from the top of the swing to impact is massive, for it must travel from zero to a speed in excess of 100 mph at the ball, all in about 2/10ths of a second. It is not 'power', as such, that is needed it is pure acceleration which is achieved through the correct application of leverage in an ordered sequence of motion.

Stop action or series photography shows the wrist cock of the top class players retained until very late in the downswing. In the final segment prior to impact the hands move just a few inches but the clubhead moves many feet, in the same time span.

The path traced by the clubhead in the full swing is not a circle in the strict sense but, for our purposes, let us consider it as such for the moment. Peak acceleration can only attain maximum velocity at one tiny segment of that

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circle. If that peak is 100 mph say six feet from the ball, it will have fallen to about 80 mph at the ball.

Kinetic energy in the clubhead is proportional to the mass and also to the velocity squared. To increase the energy it is sound reasoning to increase velocity for it is a squared factor. In the physical sense any decrease in mass has only very minor effect but in the psychological it has a vast bearing.

Muscular contraction is not a constant output, it varies according to the task to be performed and the output is allocated by the brain in preprogramming. If a club feels heavy our sub-conscious urge is to lash with it from the very beginning of the swing down in order to achieve the speed we know we need at the bottom. The wrists release very early and peak velocity is attained much too soon. If, on the other hand, the club feels light headed and very easy to swing then that panic ridden urge to 'lash from the top' is not there. The lashing effect is at the bottom, where it should be.

This also has a marked effect on accuracy for that primal urge is usually accommodated by a lunge of the right shoulder out and around instead of calmly down and under.

It is an object of this invention to produce a golfclub that achieves the objects set out in the foregoing. Of course the invention is equally applicable to other sporting items such as bats, racquets etc., and to tools such as axes etc. However, the invention will be described with reference to golf clubs but it is not intended to be limited thereto. Therefore the general term "An article to be swung in use" as used in the claims is defined as meaning in this specification sporting items such as clubs, bats, racquets and the like and tools such as axes, picks and the like and other similar items.

In one general form the objects of the invention are achieved by increasing the weight of the club at or near the grip end of the shaft.

DISCLOSURE OF INVENTION

The invention in its broadest form comprises an

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article to be swung in use comprising a handle or shaft adapted to be gripped towards one end by one or both hands and a head or body portion connected towards the other end of the handle or shaft, characterised in that the handle or shaft is given additional weight to move the static balance point of the article as a whole towards the gripped end of the handle or shaft away from the head or body.

Generally speaking the weight would be placed as near to the end of the shaft as possible so that static balance point or the centre of gravity of the club as a whole is moved up the shaft as much as possible. The weight may take any suitable form such as a metal insert in the hollow end of the shaft. This would not effect the appearance or the grip of the club in any way.

BEST MODE OF CARRYING OUT THE INVENTION

In the accompanying drawing the shaft 1 has a grip 2 at one end and a metal insert 3 is fitted in the hollow end 4 of the shaft.

Another inventive concept will now be described. The presently used weights for clubheads is more or less the optimum for maximum efficiency. In this inventive concept the clubhead weight is rearranged to increase the "mass" effect on the movement of the ball when struck.

In one form this is achieved by reducing the size of the hosel 5 and the equivalent weight is added to the clubhead. The weight in the clubhead is rearranged in a special manner. There is an optimum striking position on the club face of all clubs, commonly called the "sweet spot". The mass behind the sweet spot is so arranged that it is greatly reduced directly behind the sweet spot but is increased around this area. This means that if the ball is struck directly by the sweet spot then the mass all round the sweet spot will contribute to its motion. If, on the other hand the ball is struck slightly off the sweet spot there is still a large mass directly behind it and its motion will not be greatly affected.

In the drawing if the sweet spot is at 6 on the head 7 the extra mass 8 will be built up at the back of the club

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around the sweet spot position 6 and the area 9 inside the built-up area 8 will be greatly reduced in mass.

In the final product the useful mass at impact will not be less than that of a conventional club, it will in fact be slightly more although the feel will be much lighter. It will weigh less but the concentration of mass will be centered around the area of impact and not over the entire head and hosel.

In this way the equation for kinetic energy will be altered in both factors, the mass (useful to impact) will be increased and the velocity will be considerably increased.

The advantages to be derived from the club of the invention are as follows:

(1) Because of the counter-balanced effect the club will be much easier to swing. This produces several very useful side effects.

- (a) Less physical energy will be expended by the golfer to achieve the effect he desires.
- (b) The backswing is much easier to execute because the weight of the head at the end of the shaft feels much lighter.
- (c) The backswing also becomes shorter and therefore easier to control and easier to execute.
- (d) Because of the physiopsychological effect the downswing is far easier to 'time' and peak acceleration is attained later and nearer the impact zone.

(2) The golfer has no direct control over the clubhead, he has direct control over his body, arms and hands and, through his hands, over the club. The additional weight in his hands and vastly lessened feel of weight in the clubhead makes him far more conscious of controlling his hands and allowing the clubhead to be no more than a reaction to his physical performance.

(3) Force/resistance. The weight is in his left hand which makes it heavier and able to offer more resistance

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to the applied force of the right. With added resistance more force can be effectively applied.

(4) The additional weight in the hands tends to slow down their speed and this greatly facilitates the late
5 release of energy and acceleration.

(5) The speed of the head at impact dictates, to a marked degree, the amount of spin imparted to the ball. Since velocity has increased so too has backspin.

(6) Since kinetic energy has increased in proportion
10 to energy expended distance increases relative to physical effort. This is important to the 'average golfer' who cannot hit one or two thousand balls a week. He will hit the ball further with more spin and not have to exert more effort in doing so.

(7) With the final release much later in the
15 downswing the face of the club is less lofted and this ensures a more direct transfer of energy into the ball. It should be pointed out that the face of the club never strikes the ball exactly at the horizontal equator but always at some
20 point below it. The lower the impact, the more glancing the blow, the less the energy is transferred and the more ineffective the strike.

(8) An immense gain in confidence and satisfaction. If a golfer used to bash his driver and his three wood in the
25 vague hope of reaching a particular par 4 in 2 he was naturally under extreme pressure. With a gain in distance of some 10% he now KNOWS he can reach it with a drive and 4 or 5 iron.

(9) Less total expenditure of energy. Because his
30 required effort is less on each shot he will not tire as quickly towards the end of a round and will not be exhausted at the end of it.

The clubs to be manufactured in accordance with this invention will approximate the conventional appearance of
35 those already being produced. In the intended head design the aim is to concentrate the most useful mass behind and immediately surrounding the selected impact area on the face of the clubs.

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The weights finally selected for each individual clubhead throughout the range of golf clubs will be constant in manufacture so that each driver head will weigh the same, each five iron head the same and so forth. The weights of the different heads in the progression from driver through to sandwedge will differ fractionally and progressively, becoming heavier as the loft of the club increases and the shaft length decreases.

The selected lofts and lies of the clubs to be manufactured will approximate current standards of production.

Another object of the invention is to balance each club against the other throughout the range of the accepted full set of clubs. This is achieved by inserting weight into the hollow top or grip end of the shaft. The greater the weight inserted the closer the point of static balance moves towards the grip end of the club. The formula used is based on the point selected to achieve static balance of the individual club when it is balanced across an edge so that the shaft lies horizontal. When optimum static and dynamic feel is achieved in such a selected club within a set of clubs all clubs within the set are then counter-balanced so that the distance from the point of balance to the grip end of the clubs is constant throughout the range of the set of clubs.

This point does vary for clubs designated as wood clubs and those designated as iron clubs. The wood clubs will have the constant distance so described from point of static balance to end of grip but this will differ from the length selected for that of the iron clubs.

In this manner there will be a selected balance point for all woods within a set of woods and for all irons within a set of irons.

The basic principle involved is that there exists an optimum mass of clubhead required for maximum impact potential with the ball at the greatest speed attainable. The aim of the invention is to maintain such optimum mass for collision but to alter the feel and dynamic weight of the club. The further the point of static balance is moved

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towards the grip end of the club by the insertion of weight at the grip end, the lighter the head feel of the club and the easier and faster the head can be swung.

Although all individual clubheads through the range will be constant in weight, sets of clubs will be produced to accommodate the individual needs of different golfers. By slight alteration of that accepted point of static balance from set to set feel can be altered accordingly. A set of clubs that suit a strong player may be, or feel to be, too heavy for a weaker player. The weaker player would require that a slightly heavier weight be inserted into the grip end of the club and the point of static balance would then be moved closer to the hands. The resultant clubs, although slightly heavier overall, actually feel lighter in the head and easier to swing.

In this manner the very powerful effects of human psychology in terms of balance and feel are accommodated in the individual, what we accept as being easier to accomplish does become easier.

The golf clubs are to be produced in sets that vary in weight feel as described so that the purchaser has a selection to meet his personal needs. There shall be approximately five standard sets of differing feel and balance. This is very simply achieved by altering the point of static balance from set to set by the use of slightly different series of counter-balance weights in the clubs. The intended purchaser need only test one club from a given set to make his selection and then all other clubs required in the chosen range will be automatically matched to feel, weight and balance to his selected club.

In this manner a series of counter-balance weights means a given set of weights progressively designed to create the constant distance previously described from point of balance to end of grip. Such a series relates to that set of weights required to so balance a given set of clubs. Five such series will result in five slightly different sets of clubs in terms of feel and balance.

Where the need arises for a set of clubs to be

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manufactured that are longer than standard the feel of head weight can be controlled by additional weight inserted into the grip end, according to the needs of the individual concerned.

5 In this manner the formula is exceedingly simple. It is the correct selection of the optimum point of static balance to achieve the static and dynamic feel desired in the sets of clubs and the use of correct counter-balance to establish it as a constant within the full range of the set
10 of clubs.

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CLAIMS

1. An article to be swung in use comprising a handle or shaft adapted to be gripped towards one end by one or both hands and a head or body portion connected towards the other end of the handle or shaft, characterised in that the handle or shaft is given additional weight to move the static balance point of the article as a whole towards the gripped end of the handle or shaft away from the head or body.
2. An article as claimed in claim 1 wherein the additional weight comprises a piece of metal inserted in the gripped end of the handle or shaft.
3. An article as claimed in claim 1 or 2 wherein the article is a golf club.
4. A set of clubs each club being according to claim 3 wherein the distance from the static balance point to the gripped end of each club is constant throughout the set of clubs.
5. A set of clubs as claimed in claim 4 wherein the added weight is varied to obtain the constant position of the static balance point.
6. An article as claimed in claim 3 wherein the head of the golf club has its mass reduced directly behind its sweetspot but increased in an area surrounding the sweetspot

[received by the International Bureau on 09 March 1983 (09.03.83);

original claims 1 to 6 cancelled; new claims 1 to 8 follow]

1. An article to be swung in use comprising a handle or shaft adapted to be gripped towards one end by one or both hands and having a head or body portion at the other end of the handle or shaft, characterised in that the static balance point of the article as a whole is moved towards the gripping end of the handle or shaft by adding weight to said gripping end and removing weight from the head or body.

2. An article as claimed in claim 1 wherein the weight added to said gripping end is a piece of metal.

3. An article as claimed in claim 1 wherein the weight added to the gripping end is about the same as that taken from the head or body so there is little change in the overall weight.

4. An article as claimed in claim 1, 2 or 3 wherein the article is a golf club.

5. A golf club as claimed in claim 4 wherein the weight of the hosel is reduced.

6. A golf club as claimed in claim 5 wherein part of the weight removed from the hosel is placed around but not directly behind the sweet-spot.

(new) 7. A golf club as claimed in claim 6 wherein part of the weight removed from the hosel is placed in the weight added to the gripping end of the shaft.

(new) 8. A set of golf clubs each club being according to claim 4, 5, 6 or 7 wherein the distance from the static balance point to the gripping end of each club is the same throughout the set.

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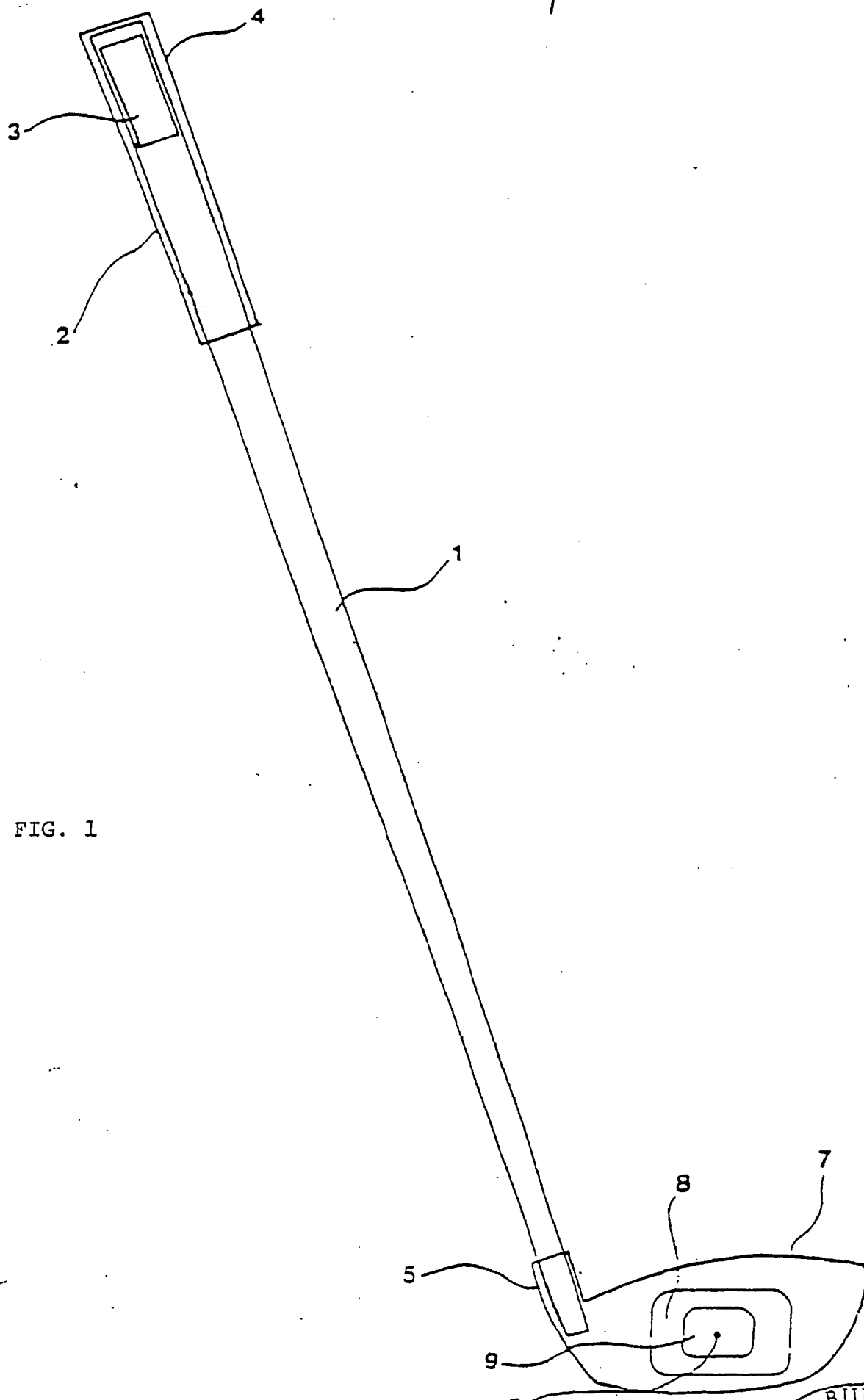


FIG. 1

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 82/00182

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC <div style="text-align: center; font-family: monospace; font-size: 1.2em;">INT. CL³ A63B 53/00</div>						
II. FIELDS SEARCHED <div style="text-align: center; font-size: 0.8em;">Minimum Documentation Searched ⁴</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; text-align: left; padding: 5px;">Classification System</th> <th style="text-align: left; padding: 5px;">Classification Symbols</th> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">IPC</td> <td style="padding: 5px;">A63B 53/00, 53/02, 53/04, 53/06, 53/08, 53/10, 53/12, 53/14 53/16</td> </tr> </table> <div style="text-align: center; font-size: 0.8em; margin-top: 5px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵</div>			Classification System	Classification Symbols	IPC	A63B 53/00, 53/02, 53/04, 53/06, 53/08, 53/10, 53/12, 53/14 53/16
Classification System	Classification Symbols					
IPC	A63B 53/00, 53/02, 53/04, 53/06, 53/08, 53/10, 53/12, 53/14 53/16					
AU; IPC as above						
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴						
Category ⁶	Citation of Document, ¹⁶ with Indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸				
X	AU,B, 17772/76 (513031) (PRATT-READ CORPORATION) 23 March 1978 (23.03.78) (& US,A, 4128242, & JP,A, 52062530)	(1-5)				
X	AU,A, 84485/75 (SQUARE TWO GOLF CORPORATION) 10 March 1977 (10.03.77) (& US,A, 4058312, & JP,A, 51077441)	(1-5)				
X	AU,B, 17012/28 (LETHABY) 26 November, 1928 (26.11.28)	(1-3)				
X	GB,A, 2023012 (RIV-SKF OFFICINE DI VILLAR PEROSA S.p.A.) 28 December 1979 (28.12.79)	(1-3)				
X	GB,A, 2040693 (FROST) 3 September 1980 (03.09.80) See page 1 lines 72-86.	(1-3)				
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>⁹ Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>						
IV. CERTIFICATION						
Date of the Actual Completion of the International Search ¹ <div style="text-align: center; font-family: monospace; font-size: 1.2em;">24 December 1982 (24.12.82)</div>		Date of Mailing of this International Search Report ¹ <div style="text-align: center; font-family: monospace; font-size: 1.2em;">10 January 1983 (10.01.83)</div>				
International Searching Authority ¹ <div style="text-align: center; font-family: monospace; font-size: 1.2em;">AUSTRALIAN PATENT OFFICE</div>		Signature of Authorized Officer ¹⁰ <div style="text-align: center;"> </div>				